Health Bulletin

00-01

Mallinkrodt Chemical Works Mortality Study

The Mallinckrodt Chemical Works Uranium Division, from 1942 to 1966, processed and refined highly concentrated uranium ore into pure uranium oxide and uranium metal. This work involved exposure to radiation, uranium metal, and chemicals. This study was undertaken to learn whether or not the work resulted in any increased risk of dying from cancer and other health conditions. The lead scientist was Dr. Elizabeth Ellis of the Oak Ridge Institute for Science and Education, Center for Epidemiologic Research, with funding from the National Institute for Occupational Safety and Health.

Plant records were used to identify 2,514 white male employees that worked at the plant for at least 30 days between 1942 and 1966. Women and people of color were not included in this study because none worked in the uranium process areas during that time. As the kidney is sensitive to both ionizing radiation at very high levels and to the toxic effects of uranium metal, cancer of the kidney and other kidney conditions were of special interest. The mortality analysis was based on 1,013 deaths through December 31, 1993. The study found that the overall death rate in workers was lower than expected when compared with the U.S. general population.

When the study looked at specific causes of death, some rates were slightly higher, others were slightly lower than expected, but none were different from the U.S. general population on a statistical basis. There were 14 deaths from kidney cancer and other kidney conditions where about 10 would be expected.

Scientists then looked at whether death rates for 28 health conditions increased as radiation dose increased. Only the kidney cancer mortality rate increased in this way; about 11% for each 10 mSv (1 rem) of external total dose. Because this was based on 10 deaths the researchers could say only that the risk was somewhere between 1% and 58% for each 10 mSv of external total dose. Seven of the 10 workers had been employed in the pitchblende processing area. This risk estimate was considered preliminary because the total dose for these workers did not include doses from internal exposures to inhaled uranium, radium, and radon. NIOSH is considering additional studies of the Mallinckrodt workers to better understand the contribution of internal exposures to the occurrence of kidney cancer.

The results of this study were presented to workers at Mallinckrodt, Inc., in St. Louis, on September 23, 1998. The report is published in the July 1, 2000 issue of the American Journal of Epidemiology. A copy of the article is being made available through the DOE reading rooms. The results of this study have been provided to committees that review and make recommendations regarding radiation health protection standards in the United States. If you have any questions you may contact Dr. Gerald Petersen on (301) 903-2340.